Reply to
No Contradictions between Bohmian and quantum mechanics

Partha Ghose

S. N. Bose National Centre for Basic Sciences, III/JD, Salt Lake, Calcutta 700 098, India

arXiv:quant-ph/0008007v1 1 Aug 2000

In a recent paper[1] Marchildon has claimed that the basic conclusion of my papers[2, 3] regarding the incompatibility of Bohmian mechanics and standard quantum mechanics is unfounded. This is based on a simple mistake. Let us consider Marchildon's final equation (18) which he uses to refute my claim. Let $y = x_1 + x_2$. Then eqn.(18) can be written as

$$\frac{dy}{dt} = cy, \tag{1}$$

where $c = \frac{\hbar k}{mL}$. Integrating this we get

$$y(t) = y(0)e^{ct}. \tag{2}$$

Since $y(0) = x_1(0) + x_2(0) = 0$ by assumption, it follows that $y(t) = 0$ for all t. Q. E. D.

As would be clear from my papers, the conditions under which Fraunhoffer diffraction holds was essential for the conclusion I drew. If one carries out these approximations in Marchildon's calculations, the quadratic terms in a and x must be dropped[4] in his equations (13) and (14) which therefore reduce to

$$r_A \approx y - \frac{2ax}{2L} \tag{3}$$

$$r_B \approx y + \frac{2ax}{2L} \tag{4}$$

When these are substituted into his equation (17), the right hand side of his equation (18) vanishes.

What Marchildon's calculations have, in fact, established is that the assumption of translation invariance (Fraunhoffer diffraction and plane waves) imposed by me in my papers are sufficient but not necessary to obtain the basic result, namely that the trajectories are symmetrical at all times and do not cross, and therefore imply the incompatibility of Bohmian mechanics and standard quantum mechanics, as I claimed.

References

[1] Louis Marchildon, quant-ph/0007068.

[2] P. Ghose, quant-ph/0001024

[3] P. Ghose, quant-ph/0003037

[4] See, for example, M. Born and E. Wolf, *Principles of Optics*, Sixth(Corrected) Edition, Cambridge University Press, 1980, section 8.3.3